

## PATENT COOPERATION TREATY

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner  
 US Department of Commerce  
 United States Patent and Trademark  
 Office, PCT  
 2011 South Clark Place Room 524  
 Arlington, VA 22202  
 ETATS-UNIS D'AMERIQUE  
 ETATS-UNIS D'AMERIQUE  
 in its capacity as elected Office

Date of mailing (day/month/year) 26 October 2000 (26.10.00)	
International application No. PCT/FI00/00145	Applicant's or agent's file reference 990576 WO
International filing date (day/month/year) 23 February 2000 (23.02.00)	Priority date (day/month/year) 16 March 1999 (16.03.99)
Applicant SANDBERG, Per	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:  
 02 October 2000 (02.10.00)

☐ in a notice effecting later election filed with the International Bureau on:  
 \_\_\_\_\_

2. The election ☒ was

☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer R. E. Stoffel
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

## PATENT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

OUTOKUMPU OYJ  
Intellectual Property Management  
P.O. Box 27  
FIN-02201 Espoo  
FINLANDE

Date of mailing (day/month/year) 22 November 2000 (22.11.00)	<b>IMPORTANT NOTIFICATION</b>
Applicant's or agent's file reference 990576 WO	
International application No. PCT/FI00/00145	International filing date (day/month/year) 23 February 2000 (23.02.00)

1. The following indications appeared on record concerning:			
<input type="checkbox"/> the applicant	<input type="checkbox"/> the inventor	<input checked="" type="checkbox"/> the agent	<input type="checkbox"/> the common representative
Name and Address OUTOKUMPU OYJ Patent Services P.O. Box 27 FIN-02201 Espoo Finland		State of Nationality	State of Residence
		Telephone No. 358-9-4211	
		Facsimile No. 358-9-421 2978	
		Teleprinter No.	
2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:			
<input type="checkbox"/> the person	<input type="checkbox"/> the name	<input checked="" type="checkbox"/> the address	<input type="checkbox"/> the nationality <input type="checkbox"/> the residence
Name and Address OUTOKUMPU OYJ Intellectual Property Management P.O. Box 27 FIN-02201 Espoo Finland		State of Nationality	State of Residence
		Telephone No. 358-9-4211	
		Facsimile No. 358-9-421 2978	
		Teleprinter No.	
3. Further observations, if necessary:			
4. A copy of this notification has been sent to:			
<input checked="" type="checkbox"/> the receiving Office	<input type="checkbox"/> the designated Offices concerned		
<input type="checkbox"/> the International Searching Authority	<input checked="" type="checkbox"/> the elected Offices concerned		
<input checked="" type="checkbox"/> the International Preliminary Examining Authority	<input type="checkbox"/> other:		

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer  C. Cupello
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification 7 :</b> <b>F28F 1/12, 1/32</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 00/55560</b> <b>(43) International Publication Date:</b> 21 September 2000 (21.09.00)
<b>(21) International Application Number:</b> PCT/FI00/00145 <b>(22) International Filing Date:</b> 23 February 2000 (23.02.00) <b>(30) Priority Data:</b> 990576 16 March 1999 (16.03.99) FI <b>(71) Applicant (for all designated States except US):</b> OUTOKUMPU OYJ [FI/FI]; Riihitontuntie 7, FIN-02200 Espoo (FI). <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> SANDBERG, Per [SE/SE]; Zimmermansgatan 12, S-722 19 Västerås (SE). <b>(74) Agent:</b> OUTOKUMPU OYJ; Patent Services, P.O. Box 27, FIN-02201 Espoo (FI).		<b>(81) Designated States:</b> AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
<b>(54) Title:</b> COOLING ELEMENT FOR A HEAT EXCHANGER		
<b>(57) Abstract</b> <p>The invention relates to a cooling element provided with louvers to be used in a heat exchanger under the influence of passing cooling medium used for cooling another medium flowing inside a circulating element whereto the cooling element is bond by a contact area on one edge, and the louvers form an angle with the surface of the cooling element. According to the invention the cooling element (1, 11, 21, 32) is positioned so that the cooling element (1, 11, 21, 32) forms a substantially equal angle (B) to the longitudinal direction of the circulating element (2, 14, 23, 31) as the louvers (4, 12, 25, 33) form to the surface (C) of the cooling element (1, 11, 21, 32).</p> <div style="text-align: center;"> </div>		

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
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AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
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DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 00/00145

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: F28F 1/12, F28F 1/32

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: F28D, F28F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5501270 A (D.L. YOUNG), 26 March 1996 (26.03.96), figures 5-7 --	1-10
X	US 5035052 A (Y. SUZUKI ET AL), 30 July 1991 (30.07.91), figure 11c --	1-10
A	EP 0849558 A1 (VALEO THERMIQUE MOTEUR), 24 June 1998 (24.06.98) --	
A	US 3250325 A (E.E. RHODES ET AL), 10 May 1966 (10.05.66) -- -----	

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;" document member of the same patent family

Date of the actual completion of the international search

21 June 2000

Date of mailing of the international search report

12 -07- 2000

Name and mailing address of the ISA:

Swedish Patent Office

Box 5055, S-102 42 STOCKHOLM

Facsimile No. +46 8 666 02 86

Authorized officer

Annette Riedel / MRo

Telephone No. +46 8 782 25 00

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

02/12/99

International application No.  
**PCT/FI 00/00145**

Patent document cited in search report			Publication date	Patent family member(s)	Publication date
US	5501270	A	26/03/96	NONE	
US	5035052	A	30/07/91	JP 2238297 A	20/09/90
EP	0849558	A1	24/06/98	FR 2757259 A,B JP 10185478 A	19/06/98 14/07/98
US	3250325	A	10/05/66	NONE	

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WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau



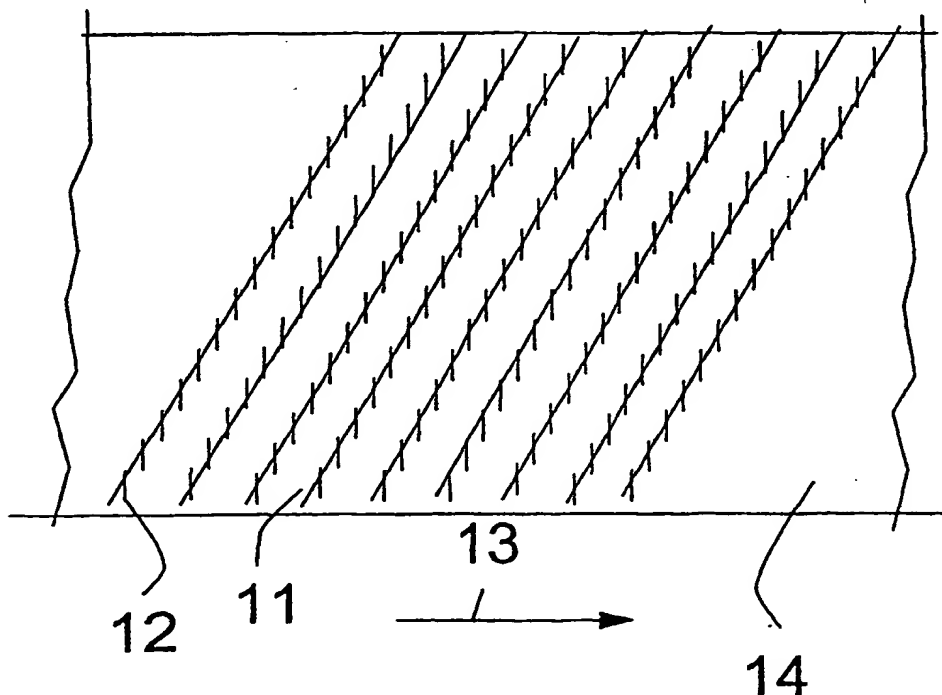
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>7</sup> : F28F 1/12, 1/32		A1	(11) International Publication Number: WO 00/55560
			(43) International Publication Date: 21 September 2000 (21.09.00)
(21) International Application Number: PCT/FI00/00145		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).	
(22) International Filing Date: 23 February 2000 (23.02.00)			
(30) Priority Data: 990576 16 March 1999 (16.03.99) FI			
(71) Applicant (for all designated States except US): OUTOKUMPU OYJ [FI/FI]; Riihitontuntie 7, FIN-02200 Espoo (FI).		Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.	
(72) Inventor; and (75) Inventor/Applicant (for US only): SANDBERG, Per [SE/SE]; Zimmermansgatan 12, S-722 19 Västerås (SE).			
(74) Agent: OUTOKUMPU OYJ; Patent Services, P.O. Box 27, FIN-02201 Espoo (FI).			

(54) Title: COOLING ELEMENT FOR A HEAT EXCHANGER

(57) Abstract

The invention relates to a cooling element provided with louvers to be used in a heat exchanger under the influence of passing cooling medium used for cooling another medium flowing inside a circulating element whereto the cooling element is bond by a contact area on one edge, and the louvers form an angle with the surface of the cooling element. According to the invention the cooling element (1, 11, 21, 32) is positioned so that the cooling element (1, 11, 21, 32) forms a substantially equal angle (B) to the longitudinal direction of the circulating element (2, 14, 23, 31) as the louvers (4, 12, 25, 33) form to the surface (C) of the cooling element (1, 11, 21, 32).



**PCT**

## NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To: <b>OUTOKUMPU OYJ</b> Patent Services P.O. Box 27 FIN-02201 Espoo FINLANDE	Received <i>Hina</i>  <div style="font-size: 1.5em; font-weight: bold;">29.09.00</div>
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Date of mailing (day/month/year) <div style="text-align: center;">21 September 2000 (21.09.00)</div>		IMPORTANT NOTICE	
Applicant's or agent's file reference <div style="text-align: center;">990576 WO</div>			
International application No. <div style="text-align: center;">PCT/FI00/00145</div>	International filing date (day/month/year) <div style="text-align: center;">23 February 2000 (23.02.00)</div>	Priority date (day/month/year) <div style="text-align: center;">16 March 1999 (16.03.99)</div>	
Applicant <div style="text-align: center;">OUTOKUMPU OYJ et al</div>			

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:  
**AU, KP, KR, US**

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

**AE, AL, AM, AT, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EA, EE, EP, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZA, ZW**

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on 21 September 2000 (21.09.00) under No. WO 00/55560

### REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a **demand for international preliminary examination** must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

### REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the **national phase**, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No. (41-22) 740.14.35	Authorized officer  <div style="text-align: center;">J. Zahra</div>  Telephone No. (41-22) 338.83.38
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# PATENT COOPERATION TREATY

From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

**PCT**

25.06.2001

*Handwritten signature*

## NOTIFICATION OF TRANSMITTAL OF INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

<p>To:</p> <p><b>Outokumpu OYJ Intellectual Property Management P.O. Box 27 FIN-02201 Espoo Finland</b></p>
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Date of mailing (day/month/year)	19-06-2001
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Applicant's or agent's file reference <b>990576 WO</b>		<b>IMPORTANT NOTIFICATION</b>
International application No. <b>PCT/FI00/00145</b>	International filing date (day/month/year) <b>23-02-2000</b>	Priority date (day/month/year) <b>16-03-1999</b>
Applicant <b>Outokumpu Oyj et al</b>		

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

<p>Name and mailing address of the IPEA/ Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88</p>	<p>Telex 17978 PATOREG-S</p>	<p>Authorized officer <i>Pia Sanemar</i></p> <p>Telephone No. 08-782 25 00</p>
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## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 990576 WO	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/FI00/00145	International filing date ( <i>day/month/year</i> ) 23.02.2000	Priority date ( <i>day/month/year</i> ) 16.03.1999
International Patent Classification (IPC) or national classification and IPC <sub>7</sub> F28F 1/12, F28F 1/32		
Applicant Outokumpu Oyj et al		

<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>4</u> sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of <u>2</u> sheets.</p>
<p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the report</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input type="checkbox"/> Certain defects in the international application</p> <p>VIII <input checked="" type="checkbox"/> Certain observations on the international application</p>

Date of submission of the demand  02.10.2000	Date of completion of this report  11.06.2001
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88	Authorized officer  Annette Riedel / JA A Telephone No. 08-782 25 00

## I. Basis of the report

## 1. With regard to the elements of the international application:\*

☐ the international application as originally filed☒ the description:pages 1-5, as originally filed

pages \_\_\_\_\_, filed with the demand

pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_

☒ the claims:

pages \_\_\_\_\_, as originally filed

pages \_\_\_\_\_, as amended (together with any statement) under article 19

pages \_\_\_\_\_, filed with the demand

pages 6-7, filed with the letter of 09.04.2001☒ the drawings:pages 1-4, as originally filed

pages \_\_\_\_\_, filed with the demand

pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_

☐ the sequence listing part of the description:

pages \_\_\_\_\_, as originally filed

pages \_\_\_\_\_, filed with the demand

pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_

## 2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).☐ the language of publication of the international application (under Rule 48.3(b)).☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

## 3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.☐ filed together with the international application in computer readable form.☐ furnished subsequently to this Authority in written form.☐ furnished subsequently to this Authority in computer readable form.☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.4. ☐ The amendments have resulted in the cancellation of:☐ the description, pages \_\_\_\_\_☐ the claims, Nos. \_\_\_\_\_☐ the drawings, sheet/fig \_\_\_\_\_5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item I and annexed to this report.

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

Novelty (N)	Claims	<u>1-9</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-9</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-9</u>	YES
	Claims		NO

**2. Citations and explanations (Rule 70.7)**

The invention relates to a cooling fin with louvers. The fin is attached to e.g. a tube and forms a substantially equal angle to the tube as the louvers form to the surface of the fin. In this way, the redirections of a cooling medium as well as the pressure drop are minimised.

Four documents were cited in the International Search Report, two of which were considered particularly relevant (A and B), and two defining the general state of the art only (C and D). The citations are:

A: US5501270 A  
B: US5035052 A  
C: EP849558 A1  
D: US3250325 A

An amended set of claims was filed. Document A addresses the problem of unwanted air-flow redirections and pressure drops, and solves it in a similar way to the present application, but in a different kind of heat transfer device where pipes penetrate the fins. B discloses a heat exchanger core with fins corrugated, louvered strip. The invention relates to a method for optimising the efficiency of the heat exchanger by satisfying an equation involving fin and louver tilt angles. However, the angle of the fin to the heat transfer element is not clearly defined. In view of the cited documents the device according to the claims is novel and cannot be considered obvious. The industrial applicability is evident. Hence, claims 1-9 fulfil the criteria set forth in Art 33(2-4)PCT.

**VIII. Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

Claim 4 is not clear. What is a "fraction line", and how does the contact area of a corrugated strip form such a line?

# CLAIMS

1. Cooling element provided with louvers to be used in a heat exchanger under the influence of passing cooling medium used for cooling another medium  
5 flowing inside a circulating element whereto the cooling element is bond by a contact area on one edge and in that the cooling element is a part of a corrugated strip which has a contact area alternatively with two circulating elements, and the louvers form an angle with the surface of the cooling element, **characterised** in that the cooling element (1,11,21,32) is positioned so that the cooling  
10 element (1,11,21,32) forms an substantially equal angle (B) to the longitudinal direction of the circulating element (2,14,23,31) as the louvers (4,12,25,33) form to the surface (C) of the cooling element (1,11,21,32).
2. Cooling element according to the claim 1, **characterised** in that the angle of  
15 the cooling element (1,11,21,32) to the longitudinal direction of the circulating element (2,14,23,31) is in the range of 20 to 45 degrees.
3. Cooling element according to the claim 1 or 2, **characterised** in that the cooling element (1,11,21,32) is positioned to the contact area with the circulat-  
20 ing element (2,14,23,31) so that the contact area with the circulating element (2,14,23,31) forms a shape of a straight line on its substantially whole length.
4. Cooling element according to the claim 1 or 2, **characterised** in that the cooling element (1,11,21,32) is positioned so that the contact area with the  
25 circulating element (2,14,23,31) forms a shape of a fraction line so that each part of the fraction line forms an substantially equal angle with the longitudinal direction of the circulating element (2,14,23,31).
5. Cooling element according to any of the preceding claims, **characterised** in  
30 that the cooling element (1,11,21,32) is made of copper.

6. Cooling element according to any of the preceding claims 1 to 4, **characterised** in that the cooling element (1,11,21,32) is made of copper-based alloy.
7. Cooling element according to any of the preceding claims 1 to 4, **characterised** in that the cooling element (1,11,21,32) is made of aluminium.
8. Cooling element according to any of the preceding claims 1 to 4, **characterised** in that the cooling element (1,11,21,32) is made of aluminium-based alloy.
- 10 9. Cooling element according to any of the preceding claims, **characterised** in that the cooling element (1,11,21,32) is a fin.

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Applicant's or agent's file reference 990576 WO	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/FI00/00145	International filing date (day/month/year) 23.02.2000	Priority date (day/month/year) 16.03.1999
International Patent Classification (IPC) or national classification and IPC <sub>7</sub> F28F 1/12, F28F 1/32		
Applicant Outokumpu Oyj et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand  02.10.2000	Date of completion of this report  11.06.2001
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88	Authorized officer  Annette Riedel / JA A Telephone No. 08-782 25 00



# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/FI00/00145

## I. Basis of the report

### 1. With regard to the elements of the international application:\*

- ☐ the international application as originally filed
- ☒ the description:  
 pages 1-5, as originally filed  
 pages \_\_\_\_\_, filed with the demand  
 pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☒ the claims:  
 pages \_\_\_\_\_, as originally filed  
 pages \_\_\_\_\_, as amended (together with any statement) under article 19  
 pages \_\_\_\_\_, filed with the demand  
 pages 6-7, filed with the letter of 09.04.2001
- ☒ the drawings:  
 pages 1-4, as originally filed  
 pages \_\_\_\_\_, filed with the demand  
 pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☐ the sequence listing part of the description:  
 pages \_\_\_\_\_, as originally filed  
 pages \_\_\_\_\_, filed with the demand  
 pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_

### 2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

### 3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

### 4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheet/fig \_\_\_\_\_

### 5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item I and annexed to this report.

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/FI00/00145

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

### 1. Statement

Novelty (N)	Claims	<u>1-9</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-9</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-9</u>	YES
	Claims		NO

### 2. Citations and explanations (Rule 70.7)

The invention relates to a cooling fin with louvers. The fin is attached to e.g. a tube and forms a substantially equal angle to the tube as the louvers form to the surface of the fin. In this way, the redirections of a cooling medium as well as the pressure drop are minimised.

Four documents were cited in the International Search Report, two of which were considered particularly relevant (A and B), and two defining the general state of the art only (C and D). The citations are:

A: US5501270 A  
 B: US5035052 A  
 C: EP849558 A1  
 D: US3250325 A

An amended set of claims was filed. Document A addresses the problem of unwanted air-flow redirections and pressure drops, and solves it in a similar way to the present application, but in a different kind of heat transfer device where pipes penetrate the fins. B discloses a heat exchanger core with fins corrugated, louvered strip. The invention relates to a method for optimising the efficiency of the heat exchanger by satisfying an equation involving fin and louver tilt angles. However, the angle of the fin to the heat transfer element is not clearly defined. In view of the cited documents the device according to the claims is novel and cannot be considered obvious. The industrial applicability is evident. Hence, claims 1-9 fulfil the criteria set forth in Art 33(2-4)PCT.

**INTERNATIONAL PRELIMINARY EXAMINATION REPORT**

International application No.

PCT/FI00/00145

**VIII. Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

Claim 4 is not clear. What is a "fraction line", and how does the contact area of a corrugated strip form such a line?

## CLAIMS

1. Cooling element provided with louvers to be used in a heat exchanger under the influence of passing cooling medium used for cooling another medium  
5 flowing inside a circulating element whereto the cooling element is bond by a contact area on one edge and in that the cooling element is a part of a corrugated strip which has a contact area alternatively with two circulating elements, and the louvers form an angle with the surface of the cooling element, **characterised** in that the cooling element (1,11,21,32) is positioned so that the cooling  
10 element (1,11,21,32) forms an substantially equal angle (B) to the longitudinal direction of the circulating element (2,14,23,31) as the louvers (4,12,25,33) form to the surface (C) of the cooling element (1,11,21,32).
2. Cooling element according to the claim 1, **characterised** in that the angle of  
15 the cooling element (1,11,21,32) to the longitudinal direction of the circulating element (2,14,23,31) is in the range of 20 to 45 degrees.
3. Cooling element according to the claim 1 or 2, **characterised** in that the cooling element (1,11,21,32) is positioned to the contact area with the circulat-  
20 ing element (2,14,23,31) so that the contact area with the circulating element (2,14,23,31) forms a shape of a straight line on its substantially whole length.
4. Cooling element according to the claim 1 or 2, **characterised** in that the cooling element (1,11,21,32) is positioned so that the contact area with the  
25 circulating element (2,14,23,31) forms a shape of a fraction line so that each part of the fraction line forms an substantially equal angle with the longitudinal direction of the circulating element (2,14,23,31).
5. Cooling element according to any of the preceding claims, **characterised** in  
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6. Cooling element according to any of the preceding claims 1 to 4, **characterised** in that the cooling element (1,11,21,32) is made of copper-based alloy.
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- 10 9. Cooling element according to any of the preceding claims, **characterised** in that the cooling element (1,11,21,32) is a fin.